

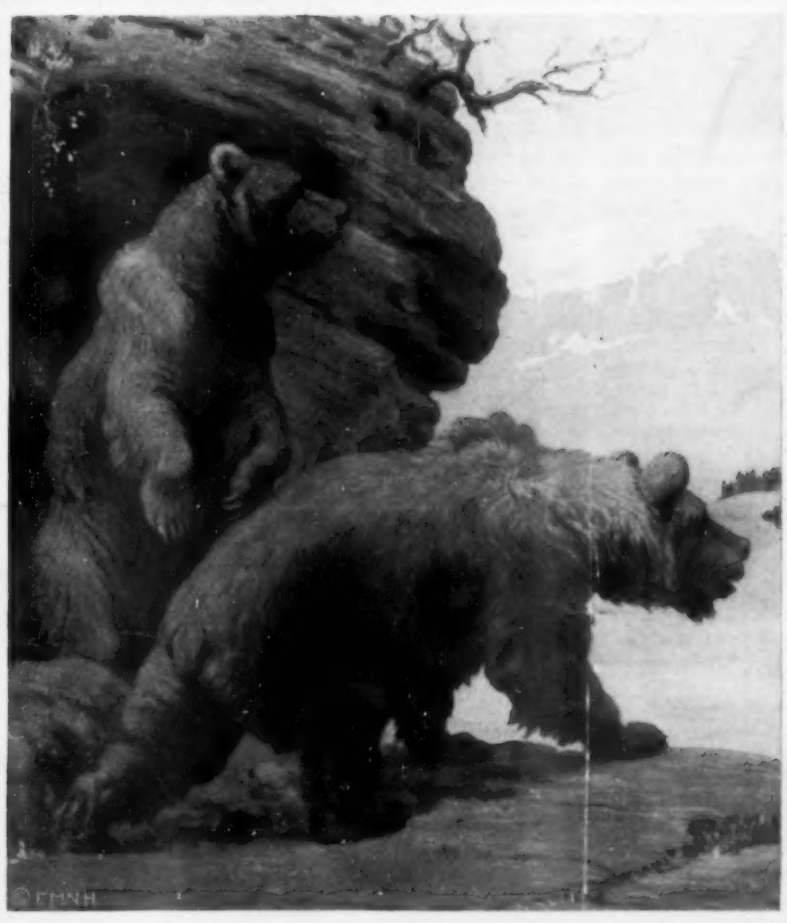
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OCT 28 1931

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



OCTOBER 24, 1931

And the Glaciers Said, "Move On!"

See Page 262

SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

VOL. XX

No. 550

The Weekly
Summary ofCurrent
Science

Published by

SCIENCE SERVICE

The Institution for the Popularization of Science organized under the auspices of the National Association of Sciences, the National Research Council and the American Association for the Advancement of Science.

Edited by WATSON DAVIS

Subscription rates—\$5.00 a year postpaid; two years, \$7.00; 15 cents a copy. Ten or more copies to same address, 5 cents a copy.

In requesting change of address, please give old as well as new address.

Advertising rates furnished on application.

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Publication Office, 1930 Clifton Ave., Baltimore, Md. Editorial and Executive Office, Constitution Ave. at 21st St., N. W., Washington, D. C.

Address all communications to Washington, D. C. Cable address: Scienservc, Washington.

Entered as second class matter October 1, 1926, at the post-office at Baltimore, Md., under the act of March 3, 1879. Established in mimeographed form March 13, 1922. Title registered as trade-mark, U. S. Patent Office.

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DO YOU KNOW THAT

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One big light and power company is using sawdust as its sole source of energy.

It is reported that an Austrian scientist has invented a match made of special chemicals and capable of being lighted 600 times.

A moving picture star recently "signed" a contract over long distance telephone, the agreement being recorded by talking moving pictures.

A thick London fog costs the shipping industry alone as much as a million pounds sterling in a day.

A "showboat" is to carry exhibits of British goods to more than thirty South American ports this winter.

In the courting season the bluejay sings a sweet love song very different from the harsh call usually associated with this bird.

Raw cabbage is the most abundant source of vitamin C in modern diet, says a home economics specialist of the University of New Hampshire.

Chlorine was discovered in 1774, by Carl Wilhelm Scheele, a Swedish scientist, when he poured concentrated hydrochloric acid upon manganese dioxide.

Government scientists find that when orange trees are sprayed with lead arsenate, the fruit loses much of its vitamin C content, and the chemistry of the juice changes.

Sir Humphry Davy named iodine from a Greek word meaning violet.

A giant mushroom that weighed 12 pounds was discovered recently in the Great Smoky Mountains; and while it was not poisonous, it was too tough for a table delicacy.

An Illinois report on the comparative causes of death in men and women finds that in one year 5,623 men died from accidents, suicide, and homicide, as compared with 1,846 women.

A Swedish chemist has discovered that a fireproof material can be produced from peat by treating it with dilute phosphoric acid.

WITH THE SCIENCES THIS WEEK

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Science Service presents over the radio, an address

STREET TRAFFIC ENGINEERING

By Dr. Miller McClintock, of Harvard University.

Friday, October 30, at 3:45 P. M., Eastern Standard Time

Over Stations of

The Columbia Broadcasting System

PHYSICS

New X-Ray Device Shows Up Human Interior in Relief

Shadow Pictures Projected on Fluorescent Screen by Impulses Emitted Alternately from Pair of X-Ray Tubes

A STEREOFLUOROSCOPE X-ray instrument that shows the inner workings of the human body as though it were a moving picture has been perfected at the California Institute of Technology and will be forwarded in a few days to the Henry Phipps Institute at Philadelphia where practical medical experiments are to be conducted.

Several months ago a rough experimental model was completed and caused great interest when introduced to the medical world. When it proved a success funds were secured from the Rockefeller Foundation for construction of a more elaborate instrument designed for use in hospitals.

The instrument was developed by Dr. Jesse W. M. Du Mond, research fellow in physics, Dr. Archer Hoyt, teaching fellow in physics, and Clarence Brandmyer, at the California Institute of Technology. These men worked out the details of the instrument which was built during the last three months.

Single Transformer

An announcement inviting the public to view the instrument reveals that it consists of two X-ray tubes connected to a single transformer so that they are alternately caused to emit X-rays by alternations of a fifty-cycle alternating current. The alternate X-ray impulses emitted by the tubes project alternate shadow pictures of the object to be viewed on a single fluorescent screen. Since the tubes are spaced apart at approximately the same distance as the distance between the two eyes, the shadow pictures projected on the screen differ slightly in the point of view in the same way that two images in the right and left eye differ respectively from each other when the eyes view any object in three dimensions.

To give the impression of a three-dimensional stereoscopic plastic relief, it is only necessary to arrange that each eye shall see one and only one of the two images formed by the two tubes. This is accomplished by means of a special rotating shutter placed before the

eyes and driven by a synchronized motor in such a way that the right eye looks at the time the right-hand X-ray tube is emitting rays and the left eye looks at the time the left tube is emitting.

By observing certain geometrical relationships between parts it is possible to have the stereoscopic image appear in space in front of the screen as an exact scale reproduction. Calipers are provided that can be introduced into the image and brought into apparent contact with any two parts of the image whose separation or size is desired.

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ETHNOLOGY

Scientist Obtains Data On Crow Indian Folklore

NEW INFORMATION regarding the myths, prayers and narratives of Crow Indians of southeastern Montana has been obtained by Dr. Robert H. Lowie, of the University of California. Dr. Lowie, who has come to Washington to be chairman of the division of anthropology and psychology of

the National Research Council, spent most of the summer on the Crow reservation, making careful notes of the stories and prayers that Crow Indians have known and repeated for centuries.

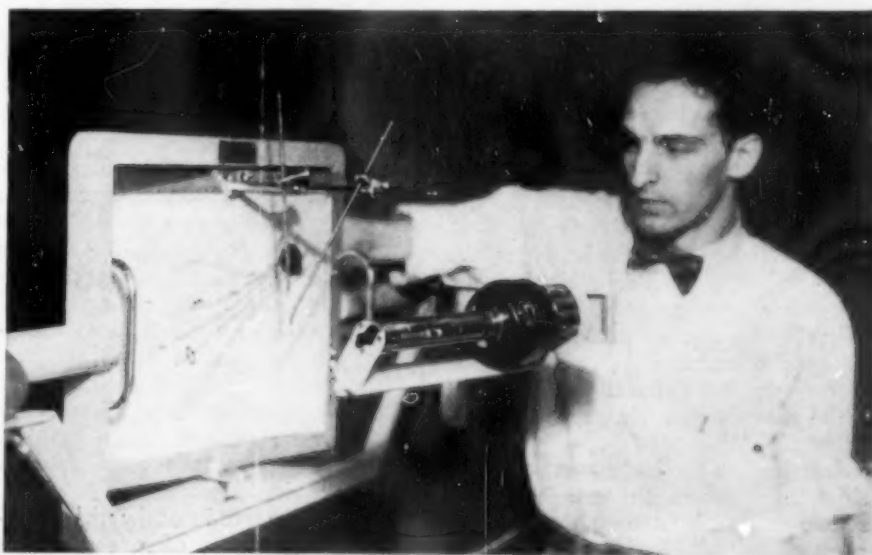
From the large amount of material which he has written down in Crow language and translated, Dr. Lowie expects to analyze the Crow language. Crow is not one of the "dying" languages, he explains. It is very much alive among the Indians of the reservation. But the younger generation uses English to a considerable extent, too, and when a group deals in two languages the old forms of speech become materially altered. Hence, it is important to science to salvage data regarding the language as rapidly as possible.

Versions Differed

Crow Indians told Dr. Lowie their story of how the world was created, and he found the account different in many details from versions he had previously encountered. Comparing the versions of myths such as this yields valuable information to the student of Indian tribes. If a story told by members of one tribe has the same details as a story told by another tribe, the ethnologist has reason to believe that there must have been contact between the tribes. Since Americanists are especially interested in tracing the influences of tribe upon tribe in ancient times, this type of evidence is eagerly sought.

The language of the Crow Indians has not been intensively studied heretofore, Dr. Lowie says.

Science News Letter, October 24, 1931



THE X-RAY MOVIE

Dr. Archer Hoyt, one of the developers of the new apparatus, shows the effect produced when the shadow pictures are projected on the fluorescent screen.

ANTHROPOLOGY

Man's Relative Hairlessness Not Due to Wearing Clothes

MAN DID NOT lose the bulk of his body hair because he took to wearing clothes, or because of any other environmental change adopted by him or forced upon him. The relative hairlessness of humankind is simply the most extreme expression of a general evolutionary trend to reduce the hairy coat in all the highest primates—man and the large apes. Some of the great apes have even fewer hairs per square inch of scalp, and the gorilla at least is often not as hairy-chested as a man.

This is among the conclusions reached through a comparative study of hairiness among monkeys, apes and men, conducted by Dr. Adolph H. Schultz of the Johns Hopkins Medical School and reported to *Human Biology*.

Dr. Schultz selected areas of one square centimeter each, on head, chest and back of human beings of three different races and of many species of monkeys and apes. On each of these areas he painstakingly counted the hairs, and then multiplied the number by the total area in square centimeters, to get the total number of hairs.

Several of his results are not what might be expected from a priori assumptions. Human beings were found, for example, to have more hairs on their heads than some of the apes. The average number of scalp hairs per square centimeter was 312 for man and 307 for thirteen specimens of the large anthropoid apes. The gibbon, a small Asiatic ape, was much hairier on the head, with 2,035 hairs per square centimeter, and one monkey species, *Aotus*, had twice as many as that, with 4,083.

Gorillas are less hairy-chested than many men. Two adults had only six and three hairs, respectively, per square centimeter, whereas a man—not a very hairy-chested one at that—had nine. Two chimpanzees were also relatively bare-chested, with counts of 43 and 59; while the gibbon again showed a high count of 499.

In regard to the back, man scored an absolute blank, with zero hairs per square centimeter; the anthropoid apes averaged only 276, but the gibbons 1,727. Various lower monkeys were even more hairy-backed.

Scalp hair varies in density among

the human races, it appears. Six adult Negroes averaged 297 hairs per square centimeter, and three adult white men had a few more, with an average count of 333. But a Hawaiian showed only 216 per square centimeter, and a Chinese as few as 128.

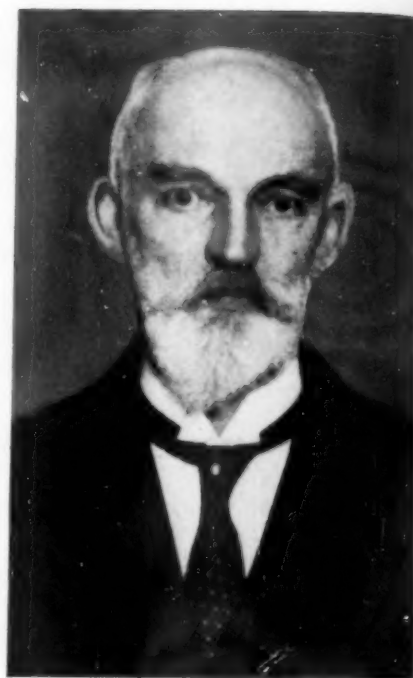
Science News Letter, October 24, 1931

ASTRONOMY

"Universe Maker" Begins Tour of American Cities

THE GREAT DUTCH "universe maker," Dr. Willem de Sitter, director of the world's oldest observatory, the "Sterrewacht" at Leyden, Holland, has begun a lecturing visit to American centers of science. For four months he will travel in this country and Canada, meeting American astronomers and describing to audiences the astronomer's present conception of the universe.

Dr. de Sitter will spend some time at Mt. Wilson Observatory, Pasadena, Calif., arriving there on New Year's Day. Earlier he will lecture in New York, Philadelphia, Washington, Prince-



DR. WILLIAM DE SITTER
Director of the world's oldest astronomical observatory

ton, New Haven, Amherst, Providence, Montreal, Toronto, Delaware (Ohio), Ann Arbor, Chicago, Evanston, Des Moines, Austin and other places.

He will deliver the famous Lowell Lectures at Boston, and the Hitchcock Lectures at the University of California.

Science News Letter, October 24, 1931

INVENTION

Ribbon Microphone Keeps Noises Out of Sound Movies

THE DIRECTOR may shout and the camera grind loudly, but only the desired music and the voices of the actors will be heard in the talking movies being filmed, if the noisy director and camera are in the plane of zero reception of a new type of microphone that has been developed recently.

The pressure type of microphone now in use in recording sound pictures has practically no sense of sound direction, picking up all sounds promiscuously. The result is that objectionable noises, such as those produced by the grinding of the camera, often cause great worry and inconvenience in making a talking film. But the new instrument, known as a ribbon microphone,

has a marked directional characteristic.

The ribbon type microphone is essentially a light metallic ribbon suspended in a magnetic field and freely accessible to air vibrations from both sides. This principle was suggested some time ago but little was done with the idea until the present research developed a practical instrument. This new type of microphone has not only a sense of direction but also a plane of zero reception in which the camera and all else that might add detracting noises may be placed. It is described by Harry F. Olson, of the research division of R.C.A. Photophone, Inc., in a report to the Society of Motion Picture Engineers.

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ARCHAEOLOGY

Shield-Like Paintings of Prehistoric Indian Discovered

Pictographs Found on Walls of Wyoming Canyon Show Resemblance to Heraldic Devices of Medieval Europe

A STYLE of prehistoric Indian art curiously like the heraldic shields of medieval Europe has been found in a remote region of central Wyoming by Dr. E. B. Renaud, of the University of Denver, who made an expedition to the site at the request of Science Service as one of its "archaeological minute men."

Dr. Renaud found painted on the rocks many circular, shield-like devices. Some of the circles have animals or men inside them. Others are divided into segments very much as coats-of-arms are quartered. Sometimes the Indian artist repeated his design on opposing sides of the circle, again in a fashion reminiscent of heraldic art. It is all the more remarkable to see, considering the fact that the Indian artists who made these pictures never, presumably, encountered the Spanish Conquerors with their gay royal banners.

The Indian pictographs have remained unreported to science because they are hidden away in a rocky wilderness known as Castle Rock Garden. There is only one ranch in this vast

territory. Dr. Renaud's attention was called to the hidden pictographs by David Love, of the ranch, and by Dr. Sam Knight, geologist at the University of Wyoming.

With Mr. Love as guide and with Jean Dubois as another assistant, Dr. Renaud set out over miles of rocky, rutty country to the pictograph cliffs. The pictures extend over a district a quarter of a mile long, Dr. Renaud reported. Some are a few feet above the sandy floor of the gulch. Others are high on the walls.

"The most curious, in fact unique, pictographs we saw there, are the shields or circles," said Dr. Renaud. "These disks are found sometimes grouped in panels of 10 or 12. They represent conventional designs, human and animal figures, either one in each circle, or two or three, or else arranged in quarters. Some recall the artistic Pueblo pottery made in the Mimbres Valley of New Mexico, others are more like European heraldry.

"Most of the circular pictographs seem to have been colored. The principal shades still discernible are a strong green, a pale orange, and a purplish red. These are very effective on a background varying from creamy white to yellowish brown."

Age Not Easily Determined

The age of the pictographs is not easy to determine, Dr. Renaud finds. The fact that they are incised on sandstone, rather soft in places, and that colors are still visible would suggest that the pictures are not old. On the other hand, cracks and crevices have occurred since the artists finished their work. The top of the cliff has weathered entirely away in some places, leaving a fragmentary picture. Erosion has also removed some of the rocky ledges, so that pictographs are left on the walls at heights which an artist's hand could not reach now. These facts suggest antiquity.

Further evidence of antiquity was offered by Mr. Love, who said that 15

years ago his father cut down a pine tree which rubbed its branches against one of the colored pictures. The tree which had grown up in front of the picture had 150 annual rings. The stump is still there.

All in all, Dr. Renaud estimates that this pictograph and many of the others were made at least two centuries ago, probably more, and that they are prehistoric, that is to say, "pre-white man."

Dr. Renaud also observed many incised pictures of men, animals and conventional designs of the more generally known type. These may be more recent than the circles.

Drawing men with pointed shoulders was a favorite art style judging from the pictures in the rock gallery. Uplifted arms, frequently shown, represent veneration or prayer. Some of the figures are warriors holding shield and lance.

No representations of horses, or white men, or implements of European origin were found among all the pictures examined by Dr. Renaud.

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MEDICINE

Heredity in Mental Disease Urged for Study in Country

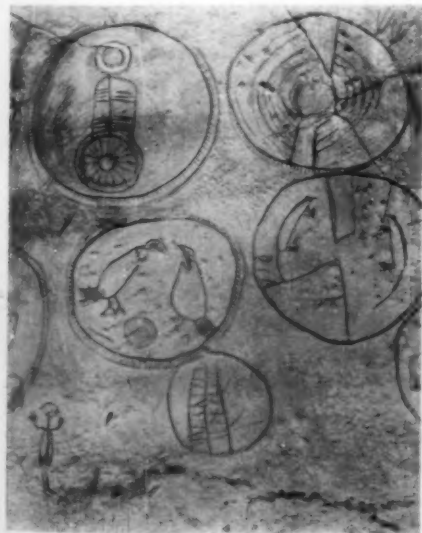
THE COUNTRY HOSPITAL has a great opportunity for research into the inheritance of mental disease, Dr. R. D. Gillespie, physician and lecturer in psychological medicine at Guy's Hospital, London, pointed out at the Congress of the Royal Sanitary Institute.

It will be a long time before the practice of eugenics has much to do with the prevention of mental disease, he said, but at least the ground might be prepared by taking advantage of the opportunities for social research waiting to be used by every mental hospital.

Much of the talk on the early treatment of mental disease is ill-founded, he continued. Exactly what constitutes the early stages of mental disease is none too sure. Mental disease of the type admitted to asylums, even if discovered in what is at present considered an early stage, is usually not susceptible to active treatment of a direct and curative nature.

Recognition of the predisposing conditions before the mental disease has developed is needed. This can only occur outside of hospitals, he said.

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"HERALDIC" ART

These are some of the circular, shield-like pictographs found in a Wyoming canyon. They have been marred by stone and bullet dents made by vandals who used them for targets.

EVOLUTION

Glaciers Caused Geological Moving Days

Animals Forced to Migrate and Evolution Speeded Up When the Earth Became Uneasy and Started to Chill

By FRANK THONE

"EVOLUTION, not revolution," is a nice-sounding catchword used on all sorts of occasions by all sorts of people, especially by conservative politicians posing as liberals. But a broad view of the evolutionary stage, recorded by a leading scientist who has just left it, indicates that evolution has often proceeded by great jumps, and that these waves of change, both in the species of animals and in their distributions, were responses to geological revolutions in the uneasy old earth itself.

One of the last writings by the late Prof. W. D. Matthew of the University of California was a condensed but inclusive inquiry into the causes of animal migrations and evolution during geologic time, especially during what may be called more recent geologic time—the last hundred million years or so.

He found, as the result of his years of study of animal evolution as disclosed by the fossil record, that there has been a sort of long rhythm in the development of life. There have been long, peaceful periods of uniform, moderate climate all over the earth, when animals have been pretty well satisfied with things as they found them and have not bothered to change much. Then there have come other periods of turmoil and change—heaving up of mountains and plateaus, gathering snows on their tops turning into vast glaciers, climates no longer uniform but sliced up into zones; life no longer easy and comfortable but full of change and uncertainty, so that a species must meet outer change with inner change, or else pay the high penalty of extinction.

Three times at least, as Prof. Matthew read the record, have such major revolutions upset the earth, prodding the plodding steps of evolution into a jazzier tempo. Three such major revolutions, with other lesser ones in between, some of them possibly more or less local in their effects.

The first of them came a most unimaginably long time ago, long before the Age of Coal, long before the Age

of Fishes that preceded it. What that revolution ended is unknown. What it started was a livelier development of the lower orders of life, and either the beginning or—more likely—the energetic unfolding of the vertebrate family tree. Expressed at first only as fishes—some of them fearful and fantastic, others more like some of the modern forms—this evolution of the backboneed animals got as far as the beginnings of the lowest land-dwelling, air-breathing animals, relatives of toads and salamanders, before the second great revolution ended the epoch and initiated a new age.

Dinosaurs Ruled

The aristocracy of this second dispensation were the famous dinosaurs, that wallowed in the swamps and swam the seas and clawed and tore each other on the solid land. But while these ponderous gentry were ruling the earth and caring no whit about changes to come, meek little primitive animals, weak of body but beginning to be nimble of wit, kept out of their way as well as possible and prepared to inherit the earth. The dinosaurs had their day, but in the end they ceased to be.

They ceased to be, perhaps, because the earth was coming to a long period

of change, of mountain-upheavals and plateau-liftings, of beginnings of zonation in climate that culminated in the most recent and perhaps the most severe of all the ice ages the earth has known. We are still but half-emerged from this ice age, for Greenland and Antarctica are still buried under permanent ice and every winter a wide snow cape spreads itself over most of the temperate zones.

The ages that stretched themselves between the end of the dinosaurs' dominance and the melting away of the glaciers that covered most of Europe and more than half of North America were times of the most rapid animal evolution that the world has ever seen. Together they are lumped by geologists as "Tertiary" time. It is an old-fashioned name, and does not mean today what it did when first applied, but it is a convenient classification.

But better than "Tertiary" is the name, Age of Mammals. For it was during this time that the warm-blooded, milk-giving creatures, to which man himself as a physical being is related, went through the series of changes that brought them to their present state. More swiftly than any other great class of animals ever evolved, the mammals of the Tertiary deployed themselves, tried out and discarded experimental models by the dozen and hundred, and at the end got down to something quite like 1931 designs.

This speed in evolutionary change was due to an antecedent restlessness in



Photos by Courtesy of Field Museum of Natural History.

CONSERVATIVE CAMELS

The camel tribe originated in America. Conservative members that stayed at home and grew no humps left llama and alpaca as descendants; the wanderers across the Bering region became the humped species of the Old World.



THE TREK

When great, sad elephants marched through snows in Asia and Alaska during glacial days.

the earth itself, Prof. Matthew believed. There was mountain-building at intervals all during Tertiary time. Some of our greatest ranges, such as the Rockies, the Sierras, and in the Old World, the Himalayas, were either lifted up entirely or received notable additions during that epoch. Naturally, with so much disturbance going on, there must have been grave upsets in the woodland and pasture economies of the animal world. Even though the changes may have taken many thousands of years, they brought about new climates, and new climates produced droughts or excessive rains, over-long winters or too-hot summers, in regions where things had been Edenic before.

Confronted with increasing rigors, the animals in such regions had but three choices: adapt themselves, move out in search of a new home like the old one before the change, or—die. Species did all three, their choice depending on adaptability, mobility, and innate, stubborn conservatism. But to adapt means to evolve on the spot; to move means to face the competition of new neighbors, forcing adaptation again. Even to die worked as a cause of adaptation, for if you didn't change, the neighbor who moved into the place you vacated probably did.

But not only did the uneasy earth thus compel its animal tenants to change with its own changes; it guided the migrations that its new climates brought about. Through the shape of the lands, the trend of its mountain ranges, the distribution of its deserts and inland seas, it made highways in certain directions and placed barriers across roads in others. It pushed warmth-loving animals southward with lengthening winters and at last with

mile-thick ice in permanent glacial caps; and as they moved in search of more summer and less winter, it either encouraged them with a Mississippi valley, or halted them with Himalayas and Caucasus and Alps.

The disposal of the continents, Prof. Matthew pointed out, has a strong bearing on the history of animal migrations. If you will examine a globe, turning it so that you can look at it directly from the top, you will see that most of the land area of the world lies in a huge circle around the Arctic Ocean. What lies below the equator can be counted as mere peninsulas: the pointed ends of Africa and South America, and the island continent of Australia, connected to the mainland through a chain of smaller islands.

Land Bridges

There are two gaps breaking this land ring at present, a narrow one at Bering Strait and a wider one across the North Atlantic. Bering Strait has unquestionably been closed by a land bridge, not once but many times. And land bridges by way of Greenland and Iceland to Europe may have existed also; the ocean is comparatively shallow at that end, most of the way.

What these northern lands may have been like, in days when there was no permanent ice, can be left to the romantic imagination. Fossil leaves of trees like those now found in California and the Gulf States, as well as those of the cooler but still rich lands of Michigan and New York, have been found in Greenland. We need only to think of how it must have been on the earth, when the vast stretches of northern Siberia and Canada, now dreary tundra and swamp and muskeg, or at

best dense spruce growth, were covered with game-filled hardwood timber like the virgin forests of the Ohio and Mississippi valleys. Only they had stranger beasts in them: rhinoceros and elephant and giant bison, as well as the more familiar deer and wild pig.

Then the uneasiness of slow upheaval, the increasing chill, the shortening summer and the diminishing of the familiar food supplies. Some beasts perish, some change their habits to meet the new conditions; perhaps most of them wander restlessly southward, edging year by year a little more toward the lands of the sun.

Perhaps some of the migrants might try occasionally to go back to the old home, but they would always run into forests where they could not find the right kind of food, or cold nights that made them glad to resume their southward trek, or quaking bogs that would swallow them, meat and bones, if they persisted in attempting to cross.

If any of them had been able to push on northward, after a suitable lapse of centuries, they should have come at last to a barrier that nothing without wings could cross: mountainous ice, stretching endlessly back toward the north. This ice was more than a blockade to northward travel on either continent; it was a closed door. The ring of land around the Pole was broken; East was East and West was West, and the animals of America, cut off from those of the Old World, could no longer intermigrate and interbreed. Hence the development of separate species below the barrier.

Strangely enough, although ice covered America about as far south as the Ohio river, and Europe from the Arctic Ocean to the (Please turn to page 268)

GENERAL SCIENCE

Edison and Slosson Talked of Many Things

In a Number of Short Interviews, the Great Inventor Told The Great Popularizer His Opinions on Science at Work

OK T.A.E. With this *imprimatur* Thomas Alva Edison attested as authentic expression of his opinion a series of brief interviews with the late Dr. Edwin E. Slosson, who, during several years before his death in 1929, had frequent occasion to visit the eminent inventor-scientist. Since these conversations always had to be written, because of Mr. Edison's deafness, it was convenient for him to OK them with his initials. These memoranda are presented here, as intimate glimpses of one of the most unusual minds the world has ever known.

Power Makes Civilization

MODERN civilization is dependent for its expansion and continuance upon an adequate supply of power. Ever since the introduction of the steam engine the main support of industry has been fossil fuel, supplemented to some slight extent by waterwheels and windmills. But these underground stores of chemical energy are obviously limited and must ultimately be exhausted. Then we must develop other sources of energy, and also begin to grow our fuel, as we do our food, from year to year.

Ease of Life and War

DO YOU expect that science and invention will continue indefinitely making life easier for the majority of people, or is it likely that increase in population will, at some future date, be so rapid as to reduce the standard of living? The standard of living in countries not disturbed by war has been rising for years, where the people have not been exploited. In my opinion it will continue to rise for centuries in such countries.

What can be done to prevent war in the future? The numerous volumes of the Encyclopedia Britannica could be filled full of plans and suggestions on this subject, not one of which would be practicable. It seems as if the nature of man would need to be changed.

Food Factories and Gold

IN SOME kinds of production the factory may displace the farmer. I believe certain foods will be made synthetically from inorganic material cheaper than by natural processes. Sugar has already been made experimentally, but not commercially. The reported synthesis of gold from mercury by the electric current does not amount to much, even if true. The value of gold is mostly psychological. It is merely an instrument for exploitation.

It is said that certain metals, especially lead and tin, are likely to run short in the near future but I am not alarmed over that. As they rise in price more mines will be worked. Immense areas in Africa, South America, and Asia have never been prospected to any extent.

Better Motion Pictures

THE MOTION picture and the phonograph will be improved and become more important factors in daily life than at present. By increasing the size of the film the picture will be enlarged and therefore show more detail and better perspective. Possibly also a stereoscopic effect will be produced. Photography in natural colors would not be of much advantage. We may perhaps some day be able to view an event, such as a baseball game or a battle scene, from a great distance, but this could only be accomplished at great expense and we have no need for it.

Burning Coal Underground

OUR IRREPLACEABLE supplies of natural gas and petroleum have been too rapidly used up in many localities by wasteful methods of extraction and utilization. Coal also is being unduly diminished by the same recklessness. As coal becomes scarcer, unworkable seams will be utilized by burning them *in situ* with the production of carbon monoxide, which can be used in gas engines with great gain in efficiency and economy. This may also be found the

best method of utilizing the bituminous shales, of which the United States has an abundance. Instead of mining the shale and then distilling off the oil from it, the bituminous portion can be burnt underground with a limited supply of air, and the carbon monoxide gas used on the spot, or piped away, to run internal combustion engines.

Power From Waves

THE WAVE POWER of the ocean may be utilized by means of tanks moored off shore and equipped with dynamos. The electrical current generated by the movements of the floating tanks would be conveyed to the shore by cables, and there used for running motors or stored in batteries.

The economical utilization of small, scattered, and variable movements such as those of the wind and waves depends upon the possibility of perfecting the storage battery so that it will be cheap, light, and lasting enough for universal use. I am confident this can be done and that storage batteries are sure to reach 90 per cent. efficiency and to have great capacity and long life.

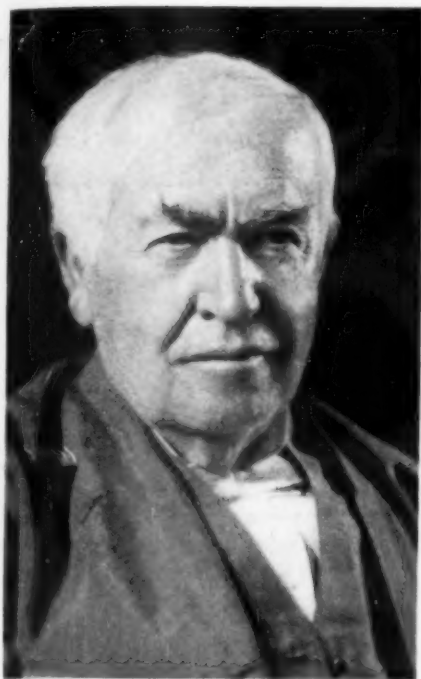
More Work for Farmers

INCREASED facilities for the transmission of power and the improvement of transportation tend toward centralization and will lead to the breakup of large cities and to the developing of rural and suburban life. Our cities are getting too congested. Mr. Ford is starting the decentralization of industry and others must follow.

Farming for three months and loafing for nine months is wrong. Something is needed that will make farmers producers during the nine months of comparative idleness. Then we will not hear so much complaining about freight rates.

Traffic and Large Cities

WHAT is going to be done about traffic congestion and parking of automobiles in cities? Cities like New York will be compelled to pass laws providing that after a certain future date no increase of manufacturing establishments shall be allowed beyond specified territorial limits; for instance,



EDISON
Who talked

on the east of New York City, below the Harlem River. Congested retail trading centers will have to spread out or lose money.

For increased transportation facilities in large cities should we look to subways, viaducts, elevated sidewalks, or some other device? Much deeper rock tunnels, subways, in which no complications of construction are met with. Also the building of high speed boats and using the river, with bus distribution may be practicable. Boats holding several hundred persons and traveling twenty-five to thirty miles an hour.

Wind Power from Balloons

WIND POWER may be made available most efficiently, it seems to me, by captive balloons, equipped with fans and dynamo. These balloons can be allowed to rise to a high altitude and will be sure to find in some stratum of the atmosphere a suitable wind blowing at any time. In case of storms the balloons could be pulled to earth. Probably the raising and lowering to find the most favorable layer can be done automatically. The electricity generated by the dynamo aloft would traverse the three guy ropes and feed storage batteries on the ground. The power for pulling down the balloons would of course come from this source, and the hydrogen necessary for inflating the gas

bags would be made by passing the current through water, with oxygen as a by-product.

Surprise of the Phonograph

THE PHONOGRAPH has, rather to my surprise, developed more as a musical instrument than a talking machine. When I invented the phonograph, July 18, 1877, I thought more of its use in business for taking dictation than for the production of music and the promotion of dancing. I still think that it will in time compete with printed books. But the musical possibilities of the phonograph are still unrealized. It is my ambition before I die to make a complete and perfect record of Beethoven's Ninth Symphony rendered by an orchestra of 75 pieces.

Revolution Through Science

THE NEW instrumentalities for the rapid and universal diffusion of knowledge are revolutionizing political and financial conditions of the past. The world is now in a state of transition. It has been a peasant and peon world exploited by monarchs, militarists, traders, religionists, and financiers, but the motion picture, the telephone, the newspapers and the schools are changing things rapidly. The day of the scientific research engineer and the economist is approaching. The exploiter will not have the easy time as of old. His ethics will be improved.

Substitutes For Oil

TO PROVIDE fuel to replace the vanishing oil and the diminishing coal, the world will have to resort increasingly to such vegetation as can be most quickly produced in large quantities at slight expense, like dried sugar cane, rapidly growing trees, etc. Any such woody material will yield, on dry distillation, tar and oils similar to petroleum, and all starchy and sugary substances will also give fuel alcohol by fermentation.

Of course there are many other possibilities of power production, but there will be needed some chemical discoveries to make them effective. However, I do not doubt that they will be made eventually.

Earth Heat and Desert Power

THERE IS in the interior of the earth an inexhaustible supply of heat, and we can at least make use of such as



SLOSSON
Who listened

serves to produce hot springs by boring shafts to a depth that will be hot enough to furnish steam under sufficient pressure for engines.

When coal becomes much more expensive sun engines will be invented that will make the arid deserts a source of wealth to the world instead of wasted areas as they have been hitherto. Wherever there are depressed areas near oceans as in Sahara, Dead Sea, and Death Valley, the sea water may be run into them, turning turbines on its way. The rapid evaporation from such immense areas under an unclouded sun would keep a constant difference of level. Salt would be a by-product of the process, as well as other and more valuable elements contained in sea water, such as iodine, bromine, and potassium.

Advice to Young Men

WHAT ADVICE would you give to a young man seeking an education that will fit him for engineering, invention, or applied science of some sort? Young men do not take advice.

What reforms would you advise in common customs of (1) diet, (2) clothing, (3) sleeping? Eat only enough to keep one's weight constant. Wear loose clothing and thus avoid pinching the fine blood channels. For dreamless sleep try five hours instead of eight.

Science News Letter, October 24, 1931

PHYSICS

The Edison Effect

"A Classic of Science"

Filament and Plate of the Electron Tube Trace to Edison While English Physicists Studied its Strange Properties And de Forest Added the Grid which Allows it to Speak

ON A PECULIAR BEHAVIOUR OF GLOW-LAMPS WHEN RAISED TO HIGH INCANDESCENCE. By William Henry Preece, in *Proceedings of the Royal Society of London*, Vol. XXXVIII. March 18, 1885. London, MDCCCLXXXV.

DURING my recent visit to America (October, 1884) Mr. Edison showed me a very striking experiment with glow-lamps, the principle of which he had not threshed out, although he had attempted to apply it practically to the regulation of the current flowing in electric light circuits.

If *abc* be the incandescent filament of a glow-lamp, *de* a thin narrow platinum plate fixed between the limbs of the filament with an independent wire connection *ee*, sealed in the glass globe, then, if a galvanometer *G* be connected between *a*, the positive electrode, and *e*, a derived current will be observed to pass through *G*, and through the rarefied space *ec* when the main current is increased to a certain strength, and the filament reaches a certain degree of incandescence. The strength of this derived current will increase with the increased brilliancy of the glowing filament. Mr. Edison made for me several lamps of different forms and character to enable me to investigate the phenomenon more carefully in England, and I have the pleasure of submitting the results of those experiments to the Society.

Experiment 1.—The connexions were made as shown in the figure. The lamp (No. 4) was a short (75 mm.) filament lamp, with a platinum plate 30 mm. long and 5 mm. broad.

The variation of the current and the increase in the resistance of the filament towards the end of the experiment, together with the behaviour of the shunt, are very noticeable. It is quite clear that when the electromotive force attained 82 volts, a critical point was

reached. From that point the current in the filament remained very steady, but the resistance gradually increased. The shunt increased in resistance enormously, and the current through it diminished, although the electromotive force increased very largely. It is remarkable how steady the electromotive force in the shunt remained until the critical point was reached, when it suddenly increased and only reached that of the main current at the point of rupture of the filament. Again the current, which steadily increased until the critical point was reached, then diminished, indicating a considerable increase in the resistance of the rarefied space *ec*. In one subsequent experiment, after the critical point was reached, no current could be obtained through the shunt.

Bright Arc Observed

The direction of the current is shown in the figure.

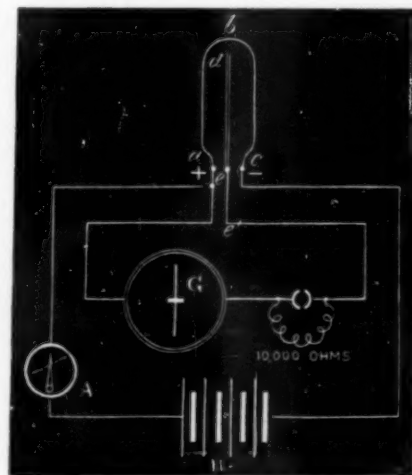
Towards the end of the experiment, when the characteristic diffused blue effect in the globe was very marked, a bright arc was observed to be playing about the bottom of the limb at *c*, and it was quite clear that a bridge of conducting material was formed between *e* and *c*, which, together with the galvanometer, made a shunt to the filament.

Although the maximum effect was produced by Mr. Edison when the plate was fixed between the limbs, he obtained a current when it was fixed in any part of the rarefied space. If the effect was due primarily to the Crookes effect, or to the projection of molecules from the carbon filament on to the metal plate, since this bombardment takes place in right lines, we ought to have obtained effects when these lines were projected on the plate, but no effects when they could not strike the plate.

Professors Liveing and Dewar ("Proc. Roy. Soc.," March 9, 1882)

observed a "sort of flame" during high incandescence, showing by its spectrum the presence of carbonic oxide. It was strongest about the junction of the carbon thread and the positive electrode. It was, according to them, the glow of the positive pole attending a discharge in rarefied gas.

It is a common thing with glow-lamps which have the heels of the filament close together to have an arc forming across when the electromotive force at the terminals is too high. Hence in recent lamps requiring 100 volts, Mr. Swan has considerably increased the distance between the electrodes. Moreover, whenever the incandescence of the filament is raised beyond a certain limit the interior of the glass envelope is blackened by a layer of carbon, which has been deposited by a Crookes bombardment effect. When the carbon filament is fixed on copper electrodes, the interior of the glass sometimes becomes coated with copper as well as with carbon, and the line between the two is perfectly marked, showing that the bombardment takes place in right lines. Experiment I. shows how very high the electromotive force can be carried, if it be steadily and rapidly increased, before the filament is broken; but practice shows that when once the blue effect appears, destruction is only a question of time. Hence the blue effect is an



PREECE'S APPARATUS

For measuring potential difference between filament and insulated grid in the tubes Edison made for him.

indication of the advent of disintegration, and a very useful warning of danger ahead.

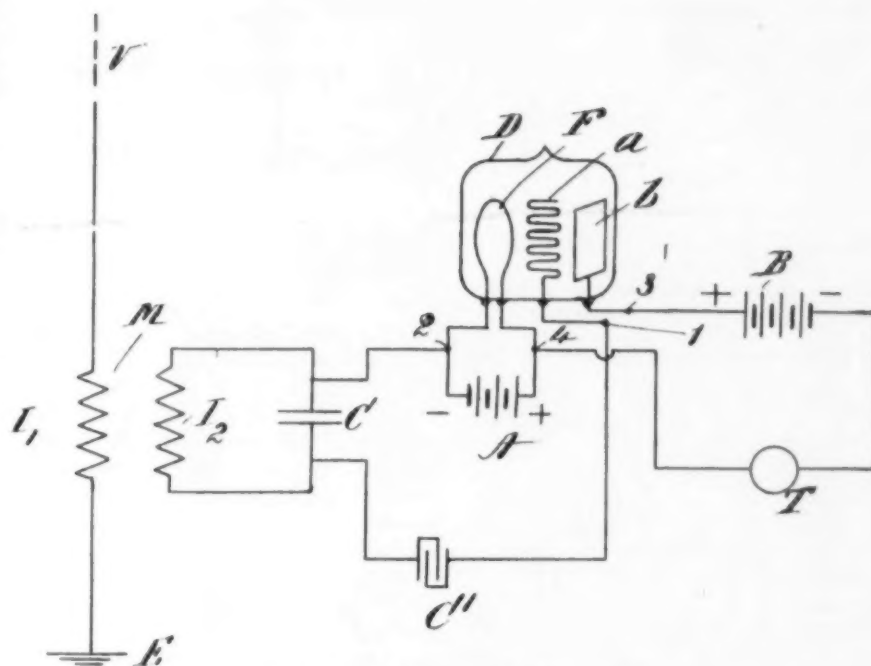
Now it is clear that we have a combination of the phenomena above described in the Edison effect. A continuous bridge of molecules is formed between the junction of the carbon filament and the metal plates inserted between its heels. They are found deposited on the metal plate. A shunt is thus formed whose resistance is measurable, and a definite current passes. This shunt is formed just where the negative metallic connexion joins the heel of the carbon filament, as we should expect from the investigations of Mr. Crookes. The current is, however, weak and variable, and it is scarcely reliable enough to be useful for practical purposes as was hoped by its discoverer. . . .

"Among the Breakers"

It is very evident that this Edison effect is due to the formation of an arc between the carbon filament and the metal plate fixed in the vacuum bulb; that this arc is due to the projection of the carbon particles in right lines across the vacuum space; and that it makes its appearance earlier, and is more strongly marked, when the connexions are as shown in Fig. 1 than when they are reversed, because, as Mr. Crookes has pointed out, the projection proceeds from the negative to the positive pole, and it would commence at the point of least resistance. Its presence is detrimental to the life of the lamp, and as its appearance is contemporaneous with the blue effect, the latter is a warning of the approach of the critical point, and a sure indication that the electromotive force is dangerously high. It is also clear that as the Edison effect is only evident when we are "among the breakers," it is not available for practically regulating the conditions of electric light currents as its ingenious discoverer originally proposed.

ON ELECTRIC DISCHARGE BETWEEN ELECTRODES AT DIFFERENT TEMPERATURES IN AIR AND IN HIGH VACUA. By J. A. Fleming, in *Proceedings of the Royal Society of London*, Vol. XLVII. December 16, 1889. London, MDCCCXC.

It has been known for some time that if a platinum plate or wire is sealed through the glass bulb of an ordinary carbon filament incandescent lamp, this metallic plate being quite out of contact with the carbon conductor, a sensi-



DE FOREST'S PATENT DRAWING

Showing the grid which he added to the electron tube, increasing its sensitivity so that it can be used in telephone circuits.

tive galvanometer connected between this insulated metal plate enclosed in the vacuum and the external positive electrode of the lamp indicates a current of some milliamperes passing through it when the lamp is set in action, but the same instrument when connected between the negative electrode of the lamp and the insulated metal plate indicates no sensible current. This phenomenon in carbon incandescence lamps was first observed by Mr. Edison, in 1884, and further examined by Mr. W. H. Preece, in 1885. The primary object of the experiments described in this paper was the further examination of this effect, but the inquiry has extended itself beyond this range and embraced some general phenomena of electric discharge between electrodes at unequal temperatures, and in particular has revealed some curious effects in the behaviour of an electric arc taken between carbon poles towards a third insulated carbon of metal poles.

The first series of experiments had reference to the nature of the effect observed in the incandescence lamps having an insulated wire or plate placed in the vacuum.

If a platinum wire is sealed through the glass bulb of an ordinary carbon filament lamp and carries at its extremity a metal plate, so placed as to stand up between the legs of the carbon horseshoe without touching either of

them, then when the lamp is actuated by a continuous current it is found that. . . .

(6.) When the lamp is actuated by an alternating current a continuous current is found flowing through a galvanometer, connected between the insulated plate and either terminal of the lamp. The direction of the current through the galvanometer is such as to show that negative electricity is flowing from the plate through the galvanometer to the lamp terminal. This is also the case in (4.); but, if the lamp has a bad vacuum, then negative electricity flows from the plate through the galvanometer to the positive terminal of the lamp, and negative electricity flows to the plate through the galvanometer from the negative terminal of the lamp. . . .

Seeking an Hypothesis

In seeking for an hypothesis to connect together these observed facts, the one which suggests itself as most in accordance with the facts is as follows:

In the case of a carbon incandescence lamp when at vivid incandescence, carbon particles are being projected from all parts of the filament, but chiefly from the negative half of the loop. These carbon molecules carry negative charges of electricity, and when they impinge upon a metal plate placed in the vacuum they can dis-

The Courage to Predict

properties of unknown elements from the general Periodic Law was characteristic of

MENDELEEFF

(or Mendeleyev)

whose specifications for elements and their compounds then undiscovered forms the next

CLASSIC OF SCIENCE

charge themselves if this plate is positively electrified, either by being in metallic connexion with the positive electrode of the lamp or with a separate positively charged body. When the plate is simply insulated the stream of negatively charged carbon molecules brings down this insulated plate to the potential of the base of the negative leg, or to the potential of that part of the carbon conductor from which it is receiving projected molecules. These carbon molecules projected from an incandescent conductor can carry negative charges, but either cannot be positively charged, or else lose a positive charge almost instantly when projected off from the conductor. . . .

SPACE TELEGRAPHY, Lee de Forest, U. S. Patent No. 879,532, Patented Feb. 18, 1908.

D REPRESENTS an evacuated vessel, preferably of glass, having sealed therein three conducting members, F, *a* and *b*, in the figure. The conducting

member or electrode F is shown as consisting of a filament, preferably of metal, which is connected in series with the battery A or other source of electrical current of sufficient strength to heat said filament, preferably to incandescence. The conducting member *b*, which may be a plate of platinum, has one end brought out to the terminal 3. Interposed between the members F and *b* is a grid-shaped member *a*, which may be formed of platinum wire, and which has one end brought out to the terminal 1. The local receiving circuit, which includes the battery B, or other suitable source of electromotive force, and the signal indicating device T, which may be a telephone receiver, has its terminals connected to the plate *b* and filament F at the points 3 and 4 respectively. The means for conveying the oscillations to be detected to the oscillation-detector, are the conductors which connect the filament F and grid *a* to the tuned receiving circuit and, as shown, said conductors pass from the terminals 2 and 1 to the armatures of the condenser C.

I have determined experimentally that the presence of the conducting member *a*, which as before stated may be grid-shaped, increases the sensitiveness of the oscillation detector and, inasmuch as the explanation of this phenomenon is exceedingly complex and at best would be merely tentative, I do not deem it necessary herein to enter into a detailed statement of what I believe to be the probable explanation.

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MEDICINE

Digestive Ferments Used in Treating Abdominal Adhesions

SUCCESSFUL experiments in the use of digestive ferments to treat troublesome adhesions which may form after abdominal operations were reported to the American College of Surgeons by Dr. Alton Ochsner and Dr. Earl Garside of Tulane University of Louisiana School of Medicine, New Orleans.

Drs. Ochsner and Garside studied 280 animals and found that in every animal adhesions reformed after operation to divide the pre-existing ones. They then tried introducing various solutions into the abdominal cavity after operating on

the adhesions. With a solution of the digestive ferment, papain, few or no adhesions reformed in over nine-tenths of the cases. Papain is obtained from the juice of the fruit of the papaya. Another ferment, trypsin, prevented the reformation of adhesions in nearly half the cases. The theory is that after the adhesions have been divided, the ferments act to assist in removing the excessive amounts of fibrinous adhesions before the organization of the fibrous tissue into new adhesions has occurred.

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Geological Moving Days

From Page 263

Alps, there was no glaciation in Asia. All of Manchuria, Mongolia, eastern Siberia, were ice-free. That does not mean that they were not cold. They probably had very severe winters, but in summer the ground thawed out and raised its usual crop of plants, and herds of animals grazed and browsed and wandered where they would.

Interior Alaska was also unglaciated, and probably there was a land bridge to Asia, so that during that time there was free migration of such creatures as the great hairy mammoth and the musk-ox between the two continents. Only they could not get southward, for advance along the west coast of North America was blocked by the Cordilleran glacier front coming down to the sea.

The southward migration of the animals did not take place as a single, gradual, coordinated movement, in Prof. Matthew's opinion. Instead there were a number of separate dispersals, or waves of migration; perhaps one to each slow convulsion of the earth.

Man No Exception

The most advanced of animals, Prof. Matthew pointed out, came down out of the cold lands latest and are still found predominantly in north temperate and subtropical regions: dogs and wolves, bears and raccoons, weasels and otters, deer and horses, and cats of all degrees.

Man himself is no exception. Australia, which gives asylum to the largest remnant of the primitive first dispersal wave of animals, also has the most primitive of living human races. Other dark races, less primitive but still unadvanced, occupy the forest lands of the southern continental projections—sharing them, by the way, with man's lesser cousins, the apes and monkeys. In the North, nearest the roots of the old glaciers, the most intelligent and progressive races have built their civilizations in Europe and Asia, and have transplanted their culture to that other glacier-scoured continent, North America.

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The windiest spot on earth so far found by explorers is on the coast of Antarctica, at Commonwealth Bay.

In the eleven far western states, motor vehicles average about 500 miles a year of travel more than cars in the other states.

BOTANY

Trees Alter the Landscape Making Stable Hills of Dunes

TREES make shifting hills of sand stand still. Plants turn lakes into solid land.

How these and other works of creation are brought about by the plant life of forests and meadows was told to the radio audience of the Columbia Broadcasting System by Prof. H. C. Cowles, head of the botany department of the University of Chicago, in a talk broadcast under the auspices of Science Service.

The work of vegetation in turning wandering sand dunes into anchored hills was outlined in rapid summary by Prof. Cowles:

"The sand dunes of our lake and ocean shores are among the most dynamic of landscapes. Even on a single windy day a dune may change its place and form considerably. One of the most interesting cases of the struggle for existence is to be seen in the dunes, where some of our hardiest plants have a bitter fight for life against the sand. Trees like the cottonwood, shrubs like the willow and sand cherry, and grasses like the sand reeds are most successful here, their victory being due to the fact that these plants are able to send out roots from their shoots if buried, or shoots from their roots if unburied.

"Eventually these plants may become abundant enough to cover the dune and prevent its further movement, whereupon a host of plant species may start on the stabilized sand, representing a second stage in dune plant succession. In this second stage there may be juniper, pine, and other plants, varying with the climate and geographic location. These first plants of the stabilized dune are those that require sunlight and can endure dry soil and high evaporation.

"As the pines and other trees of this stage grow in size, they cast more and more shade, which in time tends to cause the soil to become more moist and more suitable for shade plants and more and more unsuitable for pines—so, a situation arises where hardwoods such as oaks germinate in the shade of the light requiring pines. Thus hardwoods follow pines in natural succession.

"Similarly, in many places the oaks may be succeeded by the still more shade-tolerant beech and maple. Since

beech and maple seedlings are tolerant of the shade cast by the parent trees, they may develop in such shade without difficulty and thus carry on the same type of forest that existed there before. Beech and maple forests, therefore, may perpetuate themselves almost indefinitely. For this reason such a forest is termed a climax forest."

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PHYSIOLOGY

Hearing Affected by Rigidity of Ossicle Chain

RESearch into the causes of deafness was a chief topic considered by the American College of Surgeons during one of its sessions at New York City recently.

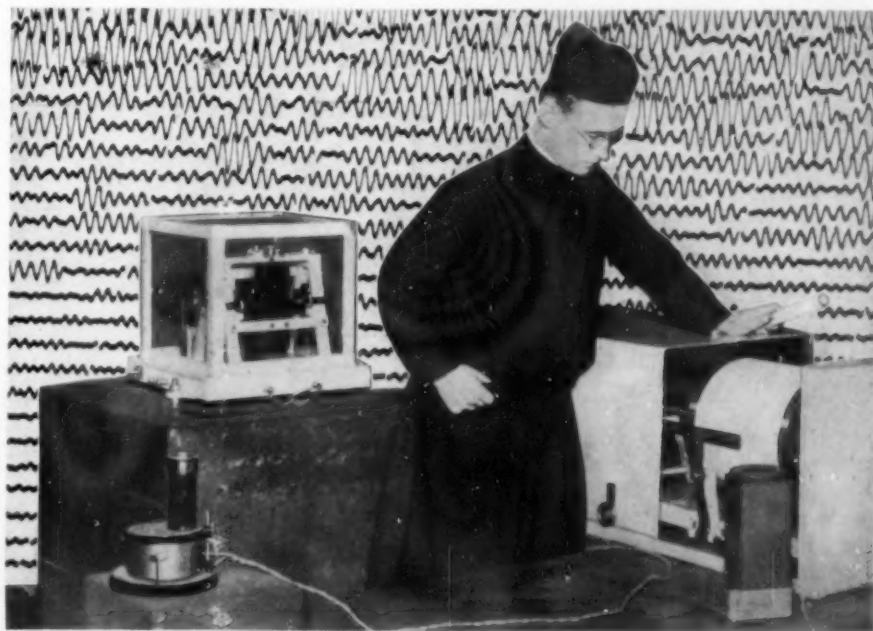
Encouraging results in the search for the causes of deafness other than infections of the ear were reported by Dr.

S. J. Crowe of the Johns Hopkins Hospital and Medical School.

Experiments have shown that changes in the length and diameter of the passage from the outer to the middle ear affect markedly the clearness and resonance of spoken words, Dr. Crowe reported. Damage to the eardrum has little effect if the tiny bones of the ear and their ligaments are not damaged. These bones, known as the ossicles, are part of the complex mechanism for transmitting atmospheric vibration caused by sound to the inner ear, where the hearing nerve receives its stimulus.

Any condition or injury which increases the rigidity of the chain of ossicles or interferes with its movements causes an impairment in the transmission of low tones, further experiments revealed. Any injury which decreases the rigidity of the chain of ossicles causes impairment in the transmission of high tones. A large part of the sound entering the normal ear is absorbed by the mobility of a membrane located between the ossicles and a part of the ear called the cochlea, which is concerned with tone perception. Making this membrane immobile greatly increases the sensitivity of the cochlea for spoken words and tuning fork tones.

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RECORDING BABY EARTHQUAKES

Recently an intense microseismic storm rocked the crust of the earth. The microseisms, sometimes referred to as "baby earthquakes," began shortly after midnight—if indeed they can ever be said to begin, since they are practically continuous. They grew in intensity until they reached remarkable amplitudes at mid-morning, and continued unabated for the rest of the day. The period of the microseismic waves was about five seconds, and the maximum amplitude exceeded one-half inch on the records of the Canisius College Seismic Observatory, Buffalo, N. Y. The indicated actual ground movement was approximately one two-thousandth of an inch. The man at the instrument is the Rev. John F. Delancy, S. J., seismologist of the Observatory.

PHYSICS

Nature Simulated As X-Rays Explode Hearts of Lead Atoms

X-RAYS, directed by mere human agencies, can now make the heavy heart of metallic lead atoms explode and disintegrate, upsetting belief and experience in physics that atomic breakdown is nature's own show incapable of control by man.

A Russian scientist, Prof. G. I. Pokrowski of the All Union Electrotechnical Institute, Moscow, has just reported to the American Physical Society that a weak radioactivity is acquired by some of the heavier chemical elements after they are irritated by X-rays. Their atoms fly to pieces in a manner similar to the disintegration of spontaneously radioactive radium.

This suggests a new method of investigating the central nucleus of the atom, which may possibly give science some way of releasing the vast stores of energy that some scientists believe are wrapped within the nucleus.

Prof. Pokrowski found that speeding corpuscles similar to the alpha rays of radioactive substances were emitted for more than an hour by samples of lead after they had been exposed 30 minutes to X-rays. A Coolidge X-ray tube, with tungsten anode and a pressure of 140,000 volts, was used to produce the X-radiation.

Scintillations on a sensitive screen formed by the impact of the atomic bullets were employed to count the particles ejected from the lead nuclei. The ionization or increased electric conducting power of the air in the neighborhood of the lead was also used as a measure of the activity.

Prof. Pokrowski first found that the artificial disintegration fell off after the removal of the stimulating X-rays; so in later experiments observations were made a fourth of a second after exposure. Larger activities were produced by longer exposure to the rays.

About a millionth of an erg was the energy of the corpuscles. This makes it very likely that they come from the nucleus of the atom and not from the outside coatings. This amount, however, is much less than the energy of ordinary alpha particles from radium.

This effect has been found only with heavier atoms, and this agrees with an earlier prediction of Prof. Pokrowski

that disintegration can occur only in atoms of atomic number above forty.

The relativity theory shows that when atoms whose total mass is smaller than the disintegrating atom are produced, energy will be available for producing such penetrating rays as those observed in Moscow. Not all of the lead atoms are open to this kind of behavior, is the conclusion drawn.

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ENTOMOLOGY

Pine Tar Oil Spray Kills Insects and Checks Fungi

A POISON SPRAY that cuts both ways, killing insects and checking the fungi that cause plant disease, has been made possible by the improvement of pine tar oil distilled from "fat" stumps and old logs in the southern states. It has been made the subject of study by Dr. E. R. De Ong, consulting entomologist of San Francisco.

The light oil that comes off after wood turpentine has been distilled out

of these forest waste products has long been known to possess insecticidal value. But it has hitherto been unsuited for general use on plants because it contained acids that poisoned the foliage and penetrated into the deeper tissues, often causing death. New processes now eliminate the acids, making the oil harmless to plants. The process is said to be commercially practicable.

Pine tar oil can be used for carrying various insect poisons, and in itself has insecticidal properties. Furthermore, it dissolves the wax on leaf surfaces, penetrating to the leaf tissue itself and carrying the dissolved insect poisons into more intimate contact than can be achieved with the usual petroleum spray bases. And since it is more volatile than the petroleum derivatives, it evaporates before it does the foliage any harm. When used where slower evaporation is desired, it may then be combined with any petroleum fraction.

A decided advantage claimed for pine tar oil as a spray base is its ability to carry copper resinate in solution. Copper resinate is a compound of copper and resin, highly toxic to disease-producing fungi. Here again the ability of pine tar oil to dissolve the waxy covering on leaves comes into play, making it possible for the fungicide to reach the tiny accidental cracks and the minute breathing pores through which fungi usually gain entrance to the leaf.

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ENTOMOLOGY

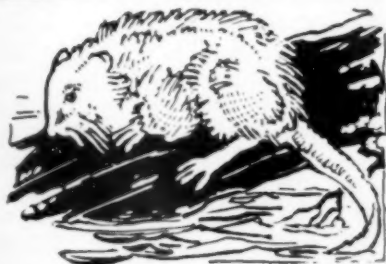
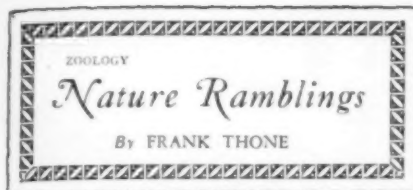
Latest News Received of Ancient Stellar Explosion

WORKING in an observatory at Cape Town, an astronomer has just learned the latest news concerning an explosion that occurred nearly 2200 years ago, when ancient Carthage was at its height. The scientist is Dr. H. Spencer Jones, His Majesty's astronomer at the Cape, and the explosion was in a star in the constellation of Pictor, the painter, which cannot be seen from northern latitudes. So distant is the star, according to Dr. Jones' calculations, that its light takes about 2173 years to reach the earth, so that the first word of this ancient explosion arrived in 1925, when a bright star was suddenly noticed where a faint one had been seen before.

Dr. Jones has also calculated the actual brightness, or candlepower, of the

star when it was shining most brightly, and this indicates that it was then about 150,000 times the brightness of the sun. Also, he finds, it suddenly increased in size. Before the explosion, it was only about eight-tenths as large again as the sun, but at the maximum it was 384 times the sun's diameter of 92,900,000 miles, making it about 350,000,000,000 miles in diameter. About this time, two shells of gas were thrown off, which travelled outward with a speed of as much as 76 miles a second for the inner shell, and 206 miles a second for the outer. Then the star began to decrease in size, its diameter diminishing at the rate of $12\frac{1}{2}$ solar diameters every day. Now it is seen nearly as faint as before the explosion.

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Beaver's Little Cousin

MANY persons are incredulous when they are first told that the beaver is a rodent, a more or less close kinsman of rats and mice. His size, his utterly unratlike tail, above all his astonishingly complex set of instincts, seem to set him off from these household pests even more remotely than man is set off from monkey.

There is, however, an excellent intermediate animal to serve as connecting link between the beaver and the more familiar rodents. Nobody will deny that the muskrat is a rat, in spite of his larger size and longer fur. His teeth and his tail alike proclaim the kinship.

As his bodily build marks him an unmistakable rodent, so do his habits point beaverward. He is quite as aquatic as his larger cousin, and like him lives on a diet of twigs and green stuff at the water's edge, though he doesn't go in for quite such ambitious gnawings. Like the beaver, the muskrat builds domed winter houses out of mud and sticks, though these again are not so pretentious. Finally, just as the muskrat lives in burrows as well as in houses, so also do beavers resort to river banks. "Bank beavers" are quite familiar animals to naturalists, though they are not played up much in most natural history books.

The muskrat has survived contact with civilization much better than the beaver, partly because of his greater multiplying powers, partly because he is less fussy about interference with his works, and partly because at first his fur was not held in very high esteem. Now, however, with the increasing rarity of the more valuable pelt-bearing animals, muskrat is coming into greater favor, both on its honest own and plucked and dyed, under a variety of trade names.

Science News Letter, October 24, 1931

ARCHAEOLOGY

Science Loses When Steam Shovel Wrecks Indian Mound

STEAM SHOVELS have completely leveled an ancient Indian mound in Jonesville, La., proper excavation of which might have shed new light on the mound-building Indian tribes of this country.

The site has been visited by Winslow M. Walker, anthropologist, of the Smithsonian Institution, who was working within a hundred miles of the place and who came to Jonesville as soon as he heard what had been encountered.

Mr. Walker, who has returned to Washington, reports that, "When I got there I found the largest and most important mound leveled by highway workers. What was left in the debris indicates that the loss to science was inestimable."

The mound was made of red, yellow, and gray clays—unlike local soil, Mr. Walker states. It appears that the Indians had transported material for building the mound from a considerable distance. The mound covered an area 250 by 160 feet, and is estimated to have stood more than 65 feet high.

In the debris were pieces of cane matting, which Mr. Walker believes may have been part of walls of a building which stood on the mound. Archaeologists have hoped to find remains of one of the temples or a chief's house in a mound settlement like this, and if the

matting had been undisturbed it might have shown how the Mound Builders' "public buildings" looked. Even in its damaged state the cane matting is considered an important find.

In another Louisiana county workmen have unknowingly broken into an old Indian site, destroying several burials before the scientific importance of the place was thought of. This place, also visited by Mr. Walker shortly after the excavation, is at Natchitoches, where a Government fish hatchery is under construction.

One Skull Unharmed

The anthropologist arrived in time to find one remarkable skull unharmed. The skull was artificially flattened front and back, probably by tying flat boards to the forehead and back of the head. These had evidently been applied when the Indian was a young child. As the child grew, the bones were pressed until they conformed to local standards of physical beauty.

This type of head flattening was characteristic of some Indian tribes, notably the Flatheads of the Northwest coast, and some Southeastern tribes. A skull of this sort, however, has not heretofore been found in the Louisiana region where the Caddo tribes lived.

Science News Letter, October 24, 1931

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• First Glances at New Books

General Science

USEFUL SCIENCE, Book I—Henry T. Weed and Frank A. Rexford—*John C. Winston Co.*, 222 p., \$1.08. Boys and girls are naturally experimentalists, a fact which school books on science have not always used to advantage. This introductory text, for seventh grades, is strongly experimental. The experiments and the lesson explanations have been kept reasonably simple, and a large number of illustrations are supplied. The subjects include water, trees, soil, foods, exercise, bacteria.

Science News Letter, October 24, 1931

Medical Economics

THE "MUNICIPAL DOCTOR" SYSTEM IN RURAL SASKATCHEWAN—C. Rufus Rorem—*University of Chicago Press*, 84 p., \$1. A publication of the Committee on the Costs of Medical Care. The report is based on personal observations made by the author during visits to five municipalities in Saskatchewan and one in Manitoba, and on questionnaires to independent physicians and to the municipal doctors themselves.

Science News Letter, October 24, 1931

Ornithology

THE PRAIRIE HORNED LARK—Gayle B. Pickwell—*St. Louis Academy of Science*, 160 p., 34 pl., \$2. He is no true son of the prairies who does not know and love the hardy little horned lark, whose thin, sweet pipings tell the gray fields that spring is coming, weeks before the first boisterous robin dares show his beak. So this treatise, getting into one place the whole story of the charming little bird, is sure of a most appreciative welcome by a large public.

Science News Letter, October 24, 1931

Fiction

THE COMING OF THE AMAZONS—Owen Johnson—*Longman's*, 251 p., \$2. Another Utopia, filled with super-airships, super-television and teleaudition devices, control over climate and all the other later-than-modern improvements. This world imagined by Mr. Johnson is made tenfold more dreadful by being placed under the absolute control of a race of stirpicultural super-women, with men reduced to the rank of social toys and temporary biological necessities—why the author didn't add a practical method of parthenogenesis it is hard to guess; except that that would have spoiled the story. In the end, the twentieth-century male who finds him-

self injected into this Eve-bossed Eden by the old device of a long hibernation escapes from its terrible tepidity by freezing himself to death—and no wonder!

Science News Letter, October 24, 1931

Chemistry

ELEMENTS OF GENERAL CHEMISTRY—Joseph A. Babor, William L. Estabrooke, and Alexander Lehrman—*Crowell*, 601 p., \$5.75. A textbook designed for college students who have had no previous courses in chemistry and who may or may not be going to take further work in the subject. The nice exposition of the scientific spirit given in the introduction starts the book off well.

Science News Letter, October 24, 1931

Chemistry

LABORATORY MANUAL IN ELEMENTS OF GENERAL CHEMISTRY—Joseph A. Babor, W. L. Estabrooke, and Alexander Lehrman—*Crowell*, 419 p., \$2. Designed for use with the authors' *Elements of General Chemistry*. The discussion at the beginning of each experiment should stimulate the student to think about the work he is doing and not merely to follow directions in a routine fashion.

Science News Letter, October 24, 1931

Metallurgy

SECONDARY ALUMINUM—Robert J. Anderson—*Sherwood Press*, 563 p., \$10. The remaking of the wastes of today into useful articles for tomorrow is the life of a number of industries not the least of which is that which turns scrap aluminum into the pots and pans and airplane parts from which it came. This book presents in clear language information necessary to a thorough understanding of the production of secondary aluminum from the scrap, and its utilization.

Science News Letter, October 24, 1931

Entomology

THE PLANT LICE, OR APHIDAE, OF ILLINOIS—F. C. Hottes and T. H. Frison—*Illinois State Natural History Survey*, 447 p., free. In describing, with completeness and thoroughness, one of the principal plant pests of one of the principal agricultural states of the Union, the authors have performed a service that will be appreciated far beyond the borders of Illinois.

Science News Letter, October 24, 1931

Physics

THE PHYSICS OF HIGH PRESSURE—P. W. Bridgman—*Macmillan*, 398 p., \$5.50. This is a comprehensive text for research workers in the field of high pressure phenomena. Prof. Bridgman recently has become known to the general public by his thought-provoking "Logic of Modern Physics." Among scientists Prof. Bridgman has an enviable reputation for his twenty-five years of experimental researches on the behavior of materials under compression. The present book is a summary of his work but at the same time surveys the whole subject adequately. Rupture, compressibility, melting, polymorphic transition, electric properties and viscosity are among the properties considered. Mathematical discussion is reduced to a bare minimum.

Science News Letter, October 24, 1931

Biochemistry

NUCLEIC ACIDS—P. A. Levene and Lawrence W. Bass—*Chemical Catalog*, 337 p., \$4.50. This is a monograph of the American Chemical Society, written for research workers in this and related fields. The nucleic acids, which contain phosphoric acid, a sugar and a cyclic derivative of urea, are the important constituent of the chromatin or chromosomes of cells and the elucidation of their structure will probably be more helpful in unravelling the fundamental problems of biology than any other single development in biochemistry. Dr. Levene is the eminent organic chemist of the Rockefeller Institute for Medical Research.

Science News Letter, October 24, 1931

Geology

PAPERS PRESENTED AT THE QUARTER CENTENNIAL CELEBRATION OF THE ILLINOIS STATE GEOLOGICAL SURVEY—*Illinois State Geological Survey*, 300 p. In addition to papers outlining the history of this important state geological survey, there are a number on various aspects of the geology of the Pennsylvanian age that are of more than ordinary interest.

Science News Letter, October 24, 1931

Physics

ANALYTICAL MECHANICS—H. M. Dadourian—*Van Nostrand*, 427 p., \$4. The third addition of an interestingly written college textbook.

Science News Letter, October 24, 1931